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10/802,428	03/17/2004	Bin Zhang	200314385-1	3515
22879 7590 05/29/2008 HEWLETT PACKARD COMPANY P O BOX 272400, 3404 E. HARMONY ROAD INTELLECTUAL PROPERTY ADMINISTRATION FORT COLLINS, CO 80527-2400				
EXAMINER WERNER, DAVID N				
ART UNIT		PAPER NUMBER		
2621				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/802,428

Applicant(s)

ZHANG ET AL.

Examiner

DAVID N. WERNER

Art Unit

2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5-15, 17-25, 27 and 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-15, 17-25, 27 and 29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. This Office action for US Patent Application 10/802,428 is in response to communications filed 22 February 2008, in reply to the Notice of a Non-Compliant Amendment of 04 February 2008. Currently, claims 1-3, 5-15, 17-25, 27, and 29 are pending. Claims 4, 16, 26, 28, and 30 have been canceled. Applicant notes that the limitations of the canceled claims have been incorporated into the independent claims.

2. In the previous Office action, claims 1-12 were rejected under 35 U.S.C. 101 as non-statutory. Claims 1-7, 10-12, 13-19, and 22-26 were rejected under 35 U.S.C. 103(a) as obvious over "Motion-based Segmentation Using a Thresholded Merging Strategy on Watershed Segments (de Smet et al.) in view of "K-Harmonic Means—A Data Clustering Algorithm" (Zhang et al.). Claims 8, 9, 20, and 21 were rejected under 35 U.S.C. 103(a) as obvious over de Smet et al. in view of Zhang et al., and in further view of "A Video Segmentation Algorithm for Hierarchical Object Representations and its Implementation" (Herrmann et al.). Claims 27-30 were rejected under 35 U.S.C. 103(a) as obvious over de Smet et al. in view of Zhang et al., and in view of US Patent 6,084,912 A (Reitmer et al.). The drawings were objected to as having reference numbers inconsistent with the specification. A Requirement for Information was made under the provisions of 37 CFR 1.105.

Requirement for Information – 37 CFR 1.105

3. Applicant's supporting documents filed in response to the Requirement for Information under 37 CFR 1.105 have been considered.

Response to Amendment

4. Applicant's amendment to the specification has been fully considered. The objection to the drawings is withdrawn.

5. Applicant's amendment to claim 1 has been fully considered but is insufficient to overcome the rejection under 35 U.S.C. 101 due to language in the specification.

Response to Arguments

6. Applicant's arguments filed 15 November 2007 have been fully considered but they are not persuasive. Applicant argues that the combination of de Smet et al. and Zhang et al. does not include the claimed limitations of "initializing regression functions for each of the K clusters to estimate the centers of motion for the data points", "calculating the distances from each data point to each of the K regression functions", and "calculating a membership probability and a weighing factor for each data point based on distances between the K regression functions and each data point", and that because of this alleged gap in the combination, there is no motivation to combine de Smet et al. and Zhang et al.

Regarding "initializing regression functions", it is respectfully submitted that while Zhang et al. states that an advantage of KHM clustering is an insensitivity to

initialization of the centers, KHM still "starts with an initialization of the center positions" (page 2). In the first iteration of the KHM algorithm, when a set of initial positions of centers is initialized, the distances d from data points x and centers m are calculated, "and then the new positions of the centers are calculated" (page 5). This initial new determination of center positions in the first iteration of the KHM function is an "estimate" of the centers of motion for the data points according to the present invention.

Regarding "calculating the distances", Applicant states that "the invention uses multiple K regression functions", while "Zhang uses a single performance function" (Arguments, page 13). However, the "each of the K regression functions" in the previous Office action was interpreted as the specific instance of KHM for each center point, since the present invention is directed to "using a K-Harmonic Means function", which was read as in the singular. Therefore, the calculation of a distance d between each data point and every center point is the claimed distance calculation according to the present invention.

Regarding "calculating a membership probability", it is respectfully submitted that the calculation of $q(i,k)$ in Zhang et al. is equivalent to probability function $p(Z,z)$ in the specification, and regarding calculating "a weighing factor", the calculation of $p(i,k)$ in Zhang et al. is equivalent to weighting function $a(z)$ in the specification, albeit with differences in notation.

Art Unit: 2621

Therefore, in view of the above, it is respectfully submitted that the combination of de Smet et al. and Zhang et al. discloses every claimed limitation of the present invention.

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

8. Claims 1-12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The relevant portions of the USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility (Official Gazette Notice of 22 November 2005), Annex IV, read as follows:

In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See *Lowry*, 32 F.3d at 2583-84, 32 USPQ2d at 1035.

Claims that recited nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, *per se*, and as such are nonstatutory natural phenomena. See *O'Reilly*, 56 U.S. (15 How.) at 112-114. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in Sec. 101.

...a signal does not fall within one of the four statutory classes of Sec. 101.

...signal claims are ineligible for patent protection because they do not fall within any of the four statutory classes of Sec. 101.

Claims 1-12 are drawn to a "computer-readable medium" storing functional descriptive material. Normally, the claims would be statutory. However, the

specification, at paragraph 0088, defines the claimed computer-readable medium as encompassing statutory material such as a "data storage", as well as *non-statutory* subject matter such as a "carrier" or "communications devices".

A signal embodying functional descriptive material is neither a process nor a product (i.e., a tangible "thing") and therefore does not fall within one of the statutory classes of §101. Rather, a "signal" is a form of energy, in the absence of any physical structure or tangible material. See *In re Nuijten*, 84 USPQ2d 1495 (Fed. Cir. 2007, *en banc* denied 2008).

Because the full scope of the claims as properly read in light of the disclosure encompasses non-statutory subject matter, the claims as a whole are non-statutory.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-3, 5-7, 10-15, 17-19, and 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Motion-based Segmentation Using a Thresholded Merging Strategy on Watershed Segments (de Smet et al.) in view of "K-Harmonic Means—A Data Clustering Algorithm" (Zhang et al.). De Smet et al. discloses using an iterative segment-merging technique to determine motion information for an image (abstract).

Regarding claims 1, 13, and 25, in de Smet et al., an initial motion field is first determined with a block-matching technique on 4×4 blocks (§ 2.1). These initial block motion vectors are used for the initial segmentation (§ 2.3). Then, the step of performing the block-based motion estimation for use in the first segmentation corresponds with the step of "providing data points". Next, the segments are iteratively merged according to similar or shared motion, according to the K-means clustering algorithm (§ 2.3). This corresponds with the step of "clustering the data points". When this process is finished, the result is a series of large segments corresponding to distinct moving regions of an image, each with an associated motion vector (§ 2.3). This corresponds with the step of "providing motion estimation". However, the present invention specifies performing regression clustering according to a K-Harmonic Means function, which is not the same as the K-means function of de Smet et al.

Zhang et al. discloses the K-Harmonic Means data clustering algorithm. Regarding claim 1, 3, and 25, Zhang et al. teaches selecting K centers $m(l)$ from N data points $x(i)$ (pg. 1), initializing center points (pg. 2) and performing an initial iteration (pg. 5), calculating distance $d(i,l)$ between data point $x(i)$ and center point $m(l)$ (pg. 4), calculating membership probability $q(i,k)$ and weighting function $p(i,k)$ (pg. 5), recursively calculating new $m(k)$, (pg. 5), and stopping when the recursively-calculated performance value stabilizes, that is, when its change with each iteration becomes small (pg. 5).

De Smet et al. discloses the claimed invention except for performing a K-Harmonic Means function to perform regression clustering. Zhang et al. teaches that it

was known to perform data clustering with the K-Harmonic Means function. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to perform clustering based on a K-Harmonic means function, as taught by Zhang et al., rather than a linear function such as the K-means function of De Smet et al., since Zhang et al. states in the abstract that K-harmonic clustering is less sensitive to detrimental effects from sub-optimal initialization than conventional clustering techniques.

Regarding claims 2, 3, 14, and 15, as previously mentioned, de Smet et al. produces a motion vector for each segment in an image (§ 2.3). As a result, the most important moving areas are determined (§ 3). Regarding claims 10 and 22, in de Smet et al., pixels are set as (x,y,t) triples, with x and y as spatial coordinates and t as a time coordinate (§ 2.2).

Regarding claims 11 and 23, de Smet et al. illustrates motion fields (figures 3-6). Although these motion fields are not shown as overlaid on the images, the examiner takes Official Notice that it was well-known in the art at the time of the invention to display a motion field superimposed on an image to provide a visual representation of motion vectors.

Regarding claims 12 and 24, de Smet et al. illustrates highlighted motion segments overlaid on an image (figures 11 and 12).

Regarding claims 5 and 17, in Zhang et al., a clustering in which initialization is randomized is described (pg. 11).

Regarding claims 6 and 18, in Zhang et al., KHM is described as a recursive function that performs until stabilization is achieved (pg. 5).

Regarding claims 7 and 19, insensitivity to initialization is an inherent result of the K-Harmonic means algorithm (abstract).

11. Claims 8, 9, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over de Smet et al. in view of Zhang et al. as applied to claims 1 and 13 above, and further in view of "A Video Segmentation Algorithm for Hierarchical Object Representations and its Implementation" (Herrmann et al.). Claims 8, 9, 20, and 21 disclose using color information to segment images, but de Smet et al. only discloses "standard watershed techniques" (§ 2.2) to perform the initial segmentation without providing details.

Herrmann et al. discloses a method for image segmentation to extract objects from a moving image. Regarding claims 8, 9, 20, and 21, after an initial block-matching motion estimation, similar to de Smet et al., images are segmented according to specific color information, followed by shape analysis, and lastly motion analysis to merge regions to determine objects (§ II). This corresponds with the claimed "predetermined criteria". In color analysis, a region is determined as homogeneous if the pixel difference in the region is below a threshold. Homogenous, connected areas are determined as "quasi-flat zones". These quasi-flat zones are further processed and become the basis for further segmentation (§ II.B). This corresponds with "portioning data according to color".

De Smet et al., in combination with Zhang et al., disclose a majority of the features of claims 8, 9, 20, and 21 as discussed above, the claimed invention except for color segmentation. Herrmann et al. teaches that it was known to segment a moving image according to color. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine image segmentation by color as taught by Herrmann et al., since Herrmann et al. teaches in page 205, third paragraph, that color analysis produces the most accurate type of segmentation.

12. Claims 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over de Smet et al. in view of Zhang et al., and in view of US Patent 6,084,912 A (Reitmeier et al.) Claims 27 and 29 are in means-plus-function format, complying with 35 U.S.C. 112, sixth paragraph. Accordingly, the "system" of claims 27 and 29 will be limited to a general-purpose computer such as a PC, as illustrated in figure 5 of the specification of the present invention. Although it is implied that the algorithms of de Smet et al. and Zhang et al. are computer-operated, neither de Smet et al. nor Zhang et al. explicitly teach this.

Reitmeier et al. discloses a video encoder. This encoder may operate on MPEG-4 video (column 1: line 57), as specified in paragraphs [0006] and [0007] of the present invention as a codec on which the present invention is applied. Regarding claim 27, the encoder of Reitmeier et al. may operate as a software application on a general-purpose computer (column 2: lines 64-67). Regarding claim 29, Reitmeier et al.

discloses frame memory 155, which stores decoded reference frames for motion compensation (column 7: line 27), as is well-known in MPEG encoders.

De Smet et al., combined with Zhang et al., discloses the claimed invention except for encoding video on a general-purpose computer. Reitmeier et al. teaches that it was known to implement an MPEG-4 encoder as software embedded on a computer. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to encode the system of de Smet et al. and Zhang et al. in a software MPEG encoder embedded on a computer, as taught by Reitmeier et al., in order to perform computationally complex functions such as motion compensation, quantization, and variable-length encoding inherent in the video coding process.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. "Trajectory Clustering with Mixtures of Regression Models" describes performing EM clustering in various applications, including video (pp. 12-16).

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on MWF from 9:00-6:30, TR from 9:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri, can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Art Unit: 2621

/D. N. W./

Examiner, Art Unit 2621

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